

Appl. No. 10/743,979
Amdt. dated 06/22/05
Response to Office Action of 03/25/2005

Attorney Docket No.: N1085-00258
TSMC2003-0898

REMARKS/ARGUMENTS

Reconsideration of this application is respectfully requested.

Claims 1-20 were pending in this application. Claims 4-8, 10 and 16 were objected to and claims 1-3, 9, 11-15 and 17-20 were rejected. Claims 1 and 5 are hereby amended, claim 4 is cancelled and claim 21 and 22 are newly added. Applicants respectfully request allowance of each of pending claims 1-3 and 5-22.

I. Allowable Subject Matter

In paragraph 5 of the subject Office action, it was indicated that claims 4-8, 10 and 16 were objected to as being dependant upon a rejected base claim but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim 4 has been cancelled and the features of objected-to, original claim 4 and its base claim, claim 1, have been combined and now appear as new claim 21. Independent claim 21 is therefore in allowable form.

The features of objected-to, original claim 10 and its base claim, claim 1, have been combined and now appear as new claim 22. Independent claim 22 is therefore in allowable form.

Claim 5, which previously depended from claim 4, has been amended and now depends from claim 1, and claims 6-8 depend from claim 5. Claim 10 depends from claim 1 and claim 16 depends, indirectly, from claim 1. Independent claim 1 has been amended and is in allowable form for reasons set forth below and therefore the objection to claims 5-8, 10 and 16 should be withdrawn.

II. Claim Rejections in View of the Bergman Reference

In paragraph 3 of the Office action, claims 1-3, 9, 11-15 and 17-20 were rejected under 35 U.S.C § 103(a) as being unpatentable over Bergman et al. (USPN 6,273,108),

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hereinafter "Bergman". Applicants respectfully submit that these claim rejections are overcome for reasons set forth below.

Amended independent claim 1 recites the feature of:

5 "cleaning said semiconductor substrate using a substantially ozone-free DI water clean operation that includes rotating said semiconductor substrate at a spin speed no greater than 350 rpm.

In contrast, the Bergman reference, titled *Apparatus and Method for Processing the Surface of a Workpiece with Ozone*, is limited to teaching clean operations that utilize ozone. The Office action indicates that "Bergman et al. disclose a process for generically stripping a photo resist mask . . . In a solution which is comprised of (O3-DIH2O) at a speed of 300 rpm." Bergman is directed to stripping photo resist from a workpiece using ozone together with a treatment liquid, which may be dionized water, as an example. The Applicants' claimed invention is distinguished as it is directed to a low-speed cleaning operation that uses DI water but not ozone. Since Bergman is directed to ozone cleaning and includes ozone in all stripping/cleaning operations, and teaches the virtues and advantages of ozone cleaning, Bergman teaches away from the claimed cleaning operation which does not use ozone.

Claim 1 therefore includes features not taught or suggested by Bergman. Claim 1 is therefore distinguished from Bergman and the rejection of claim 1, and claims 2, 3, 9, 11-15 and 17-20, which depend from claim 1, under 35 U.S.C. § 103(a) over Bergman, should be withdrawn.

III. Claim Rejections in View of the Pyo Reference

In paragraph 4 of the Office action, claims 1-3, 9, 11-15 and 17-20 were rejected under 35 U.S.C § 103(a) as being unpatentable over Pyo et al. (USPN 6,468,907). Applicants respectfully submit that these claim rejections are overcome for reasons set forth below.

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Amended independent claim 1 recites the features of "providing a semiconductor substrate with a Cu-containing conductive material formed thereon and a film directly interposed between said Cu-containing conductive material and the environment", and "cleaning said semiconductor substrate using a substantially ozone-free DI water clean operation". As such, said substrate necessarily refers to the described substrate "with a Cu-containing conductive material formed thereon and a film directly interposed between . . ." since the substrate is provided with the Cu-containing conductive material and the film formed thereon. Thus, it is necessarily this substrate "with a Cu-containing conductive material formed thereon and a film directly interposed between . . .", that is cleaned using the DI water clean operation. In Pyo, the feature of providing a semiconductor substrate with a Cu-containing conductive material formed thereon and a film directly interposed between said Cu-containing conductive material and the environment, is satisfied only by the structures shown in FIGS. 1A-1C. Column 3, lines 1-39 of Pyo, which refers to structures illustrated in FIGS. 1A-1C, does not disclose or suggest a DI water cleaning operation, much less one carried out with a spin speed no greater than 350 rpm.

The Pyo rinsing operation referred to in paragraph 4 of the Office action, is discussed only in conjunction with the structure shown in FIG. 1D which includes multiple films between the copper-containing structure (12) and the environment. Therefore, Pyo does not disclose or suggest cleaning the substrate structure of claim 1 using a DI water clean operation at a spin speed no greater than 350 rpm, as does the Applicants' invention. Pyo therefore does not achieve the advantage of the claimed invention, namely the prevention of a potential gradient that induces the breakdown of dielectric level disposed directly between copper and the environment and causes copper corrosion.

Amended independent claim 1 therefore includes features that distinguish Applicants' invention from the reference of Pyo and the rejection of claim 1 under 35 U.S.C. § 103(a) as being unpatentable over Pyo, should be withdrawn. The rejection of

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claims 2, 3, 9, 11-15 and 17-20 should similarly be withdrawn by reason of the dependency of these claims from claim 1.

CONCLUSION

Based on the foregoing, each of claims 1, 2, 3 and 5-22 are in allowable form and the application is therefore in condition for allowance, which action is respectfully and expeditiously requested.

The Assistant Commissioner for Patents is hereby authorized to charge any additional fees or credit any excess payment that may be associated with this communication to deposit account 04-1679.

Respectfully submitted,

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